



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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10 SUBSTITUTE SPECIFICATION and SUBSTITUTE ABSTRACT

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12 BACKGROUND - FIELD OF THE INVENTION

13 This invention relates to the field of devices used to protect public drinking water
14 during and after water main construction, specifically to a tri valve backflow prevention
15 apparatus and a method of its use with a temporarily installed conventional backflow
16 prevention assembly between existing water main pipe and a newly constructed, repaired,
17 or upgraded section of water main pipe, to provide water needed at the construction site
18 for pipe testing and other purposes. Its advantages relate to the temporary backflow
19 prevention assembly being exclusively connected to it, and not to the water main pipe
20 under construction, whereby when pressure and bacterial testing in the constructed pipe is
21 successfully completed and the temporary assembly is removed after construction for use
22 elsewhere, water is not drained from the constructed pipe, as in prior art methods of water
23 main construction in common use today. Water draining into the construction hole not
24 only compromises worker safety, it subjects the opened pipe to a risk of bacterial
25 contamination, causes additional good drinking water to be used for flushing the
26 constructed pipe to remove possible bacterial contamination and then to refill the
27 constructed pipe prior to its use for delivery of drinking water to the public, and also
28 causes a need for further pressure and bacterial testing. Thus, with present invention use,
29 inspection and testing time of new/added sections of water main pipe are significantly
30 reduced which translates into a reduced job cost, labor and material cost are also reduced

1 as no sleeve installation is required between existing and new sections of water main pipe
2 to replace the removed temporary backflow prevention assembly, and the time required
3 to activate the constructed pipe for delivery of drinking water to the public is significantly
4 reduced as one simply shuts off the two side valves of the present invention and removes
5 the temporary backflow prevention assembly, leaving the new/repaired/upgraded pipe
6 filled with good drinking water and ready for immediate water delivery as soon as one
7 chooses to open the main valve body of the present invention using its easily accessible
8 keyed valve stem. Since no breach ever occurs in or between the existing and
9 constructed water main pipe after the present invention is installed and successful
10 pressure and bacterial testing are initially accomplished, the new/repaired/upgraded water
11 main pipe can immediately be used, whereas with currently known prior art methods,
12 much additional labor and material expense is required to activate the constructed pipe,
13 and a large amount of good drinking water is unnecessarily wasted for additional flushing
14 and refilling of the constructed pipe after temporary backflow prevention assembly
15 removal. Further, with present invention use, the two new sleeve joints created after
16 temporary assembly removal in prior art construction are avoided, which otherwise
17 increase the after construction failure risk of the water main pipe. Use of the present
18 invention also eliminates the increased health risk posed to public drinking water as a
19 result of opening the new/repaired/upgraded water main pipe midway during construction
20 and after the constructed pipe has initially satisfied needed pressure and bacteria testing
21 requirements. The present invention tri valve apparatus has a unitary structure that
22 incorporates two side valve bodies and a main valve body together within a single
23 housing. Only the two side valve bodies remain open during construction and provide
24 the points of connection for both ends of a temporary backflow prevention assembly.
25 The two side valves of the present invention are only shut and plugged after successful
26 pressure and bacteria testing of the constructed pipe is achieved, with the main valve
27 body of the present invention being thereafter opened via its easily accessible keyed

1 valve stem to let good drinking water into the new/repaired/upgraded water main pipe for
2 delivery to the public. Thus, the main valve of the present invention is directly connected
3 between the existing and new/repaired/upgraded water main pipe at the outset of
4 construction, and it remains in place even after the pipe construction is complete and the
5 temporary assembly is removed from the side valve bodies, becoming a permanent part
6 of the water main structure during its useful life and until it needs refurbishment or
7 replacement.

9 BACKGROUND - DESCRIPTION OF THE RELATED ART

10 To protect public drinking water during the construction of new sections of water
11 main pipe, and the upgrading of existing sections of water main pipe, a jumper system is
12 commonly used. However, use of a jumper system has many disadvantages, including
13 potentially adverse affects on worker safety and/or the safety of the drinking water to be
14 delivered to the public via the new or repaired/upgraded sections of water main pipe. A
15 jumper system involves the installation of one end of a temporary backflow prevention
16 system using angled pipe fittings onto an existing water main valve and installation of the
17 opposing end of the same temporary backflow prevention system to a section of new or
18 repaired/upgraded water main pipe, also using angled pipe fittings. However, such an
19 installation of a temporary backflow prevention system typically creates an approximate
20 eight foot separation between the new/upgraded and existing sections of water main pipe
21 that will ultimately need to be connected together after the temporary backflow
22 prevention system is removed. However, before removal of the temporary backflow
23 prevention system, installation of the new or upgraded section of water main pipe must
24 be completed and it must successfully pass all pressure and bacterial testing
25 requirements. The problems begin to occur when the temporary backflow prevention
26 system is removed, as all of the water in the new or upgraded sections of water main pipe
27 used for its testing is lost, and then the new or upgraded water main pipe needs to be

1 refilled, re-flushed, and successfully pass additional pressure and bacterial contamination
2 testing prior to being used for drinking water delivery. One important problem associated
3 with the removal of the conventional temporary backflow prevention system just
4 described is that the contractors performing the new main construction typically excavate
5 back down to the whole area of the existing water main valve and the new or
6 repaired/upgraded water main pipe, and then when the jumper system is removed, all of
7 the water in the new or repaired/upgraded water main pipe that was used for its testing
8 drains into the working hole. This causes the waste of hundreds of gallons of good clean
9 drinking water, and further leaves the existing valve and new or upgraded water main
10 pipe open and exposed to the possible entry of bacteria, a procedure that defeats the pre-
11 testing step of chlorinating the inside of the new or repaired/upgraded sections of water
12 main pipe to make them bacteria-free. Worker safety can also be compromised by the
13 water drained into the excavation hole. Further disadvantages of the commonly used
14 jumper system involve the tie in of the new or upgraded water main pipe, which is
15 completed by use of a retrained ductile iron sleeve to connect the new or
16 repaired/upgraded water main pipe to the existing water main shut-off valve, followed by
17 flushing of the new/upgraded/repared water main pipe with water to remove all of the air
18 therein. The tie in takes extra inspection hours, extra man hours, extra equipment hours,
19 extra material cost, wasted large amounts of good water, and even then there is no
20 guarantee that the new water line is free of bacteria.

21 In contrast, the tri valve of the present invention is not removed and eliminates all
22 of the above-mentioned problems. The main valve of the tri valve present invention is
23 only opened after its two side valves used during construction are closed and plugged.
24 Also, during use of the present invention tri valve, the existing water main pipe is sealed
25 off at all times from bacteria intrusion. Further, the added cost of providing the present
26 invention tri valve is minimal when compared to the total cost of prior art water main
27 installations and/or upgrade that include extra man hours and equipment time needed for

1 additional pipe flushing and inspection, the amount of good potable water wasted during
2 jumper removal and the additional pipe flushing needed to remove air and possible
3 bacterial contamination, and the safety risk posed to the drinking water provided for the
4 public. No other apparatus or method is known that functions in the same manner or
5 provides all of the advantages of the present invention.

6 7 BRIEF SUMMARY OF THE INVENTION

8 It is the primary object of this invention to provide additional valve means for use
9 with a conventional temporary backflow prevention system for improved water main
10 installation and upgrade as a result of reduced man hours and equipment time, reduced
11 use of good water for flushing and testing purposes, and reduced safety risk for the
12 drinking water provided to the public after installation. A further object of this invention
13 is to provide additional valve means for improved water main installation and upgrade
14 that can be used everywhere for new and repaired/upgraded water mains. It is also an
15 object of this invention to provide additional valve means for improved water main
16 installation and upgrade that is safe and practical, and results in the use of two less joints
17 in the finished water main pipe. A further object of this invention is to provide
18 additional valve means for improved water main installation and repair/upgrade that
19 allows for the new water main pipe to be completely pressure tested and bacteria free
20 after temporary backflow prevention system removal, and require no subsequent tie in
21 procedure. It is also an object of this invention to provide additional valve means for
22 improved water main installation and upgrade that allows for fire protection on the
23 construction site at all times where a fire hydrant connection is installed. It is a further
24 object of this invention is to provide additional valve means for improved water main

1 installation and repair/upgrade that meets regulatory drinking water regulations and
2 standards.

3 The present invention tri valve, when properly made and used, will be installed
4 onto an existing section of potable water main pipe by means of a tapping sleeve, a cut-in
5 tee, an existing stub out, an existing valve, and/or other similar means, at the beginning of
6 the excavation process to install a new water main, or upgrade/repair an existing section
7 of water main pipe, for future use by residential or commercial developments to satisfy
8 potable water needs. For example, a contractor or utility company would excavate down
9 to an existing 12-inch water main with an existing 12-inch stub out tee, or install a 12-
10 inch tapping saddle to core into an existing 12-inch potable water line. Thereafter, a 12-
11 inch by 6-inch present invention tri valve would be installed by whatever means are
12 available to tie it in, in accordance with federal, state, and/or local standards or
13 specifications. When tie in is complete, the 12-inch main valve gate of the tri valve
14 present invention would be shut off. A backflow prevention assembly with two check
15 valves would be connected to the two 6-inch valves on the same side of the tri valve
16 present invention. The backflow prevention assembly contemplated for use is the same
17 one currently in use throughout the United States to prevent contamination from coming
18 back into the potable water main pipes from irrigation, fire sprinkler, and other areas
19 where backflow into existing water mains could cause bacterial contamination of the
20 potable water being used by the general public. The temporary backflow prevention
21 assembly is installed above ground with its two check valves also being positioned above
22 ground, and it is temporarily used to fill new water mains and satisfy other on-site use
23 purposes. The backflow prevention assembly connection to the present invention tri

1 valve is temporary, and when it is removed it can be reused in similar applications at a
2 next phase of new water main installation or repair/upgrade. Subsequent to backflow
3 prevention assembly connection to the present invention and after all new pipe for
4 potable water use is installed in a new development or needed pipe upgrade is complete,
5 before the new or upgraded water main pipe is activated for public use, it is pressure
6 tested and bacteria tested according to government standards. After the new or upgraded
7 water main pipe passes all testing requirements, the two 6-inch side valves of the present
8 invention tri valve are shut off and plugged. The backflow prevention assembly is
9 thereafter removed, and the 12-inch main valve on the present invention tri valve is then
10 opened. Since the new/upgraded pipe was not exposed to any air or potential bacterial
11 contamination as a result of removal of the temporary backflow prevention assembly and
12 during new pipe construction or repair/upgrade, the existing water main was protected
13 from any source of contamination backflow and it can be safely used without further
14 testing. The present invention tri valve can be used and manufactured in many sizes to
15 meet local water demands and the needs of the population served by the new and existing
16 sections of water main pipe.

17 The description herein provides preferred embodiments of the present invention
18 tri valve but should not be construed as limiting its scope. For example, variations in its
19 size; the materials of the nuts, bolts, o-rings, and gaskets used to install it; and the
20 materials used for its valve adjusting stem and valve wedge gates, other than those shown
21 and described herein, may be incorporated into the present invention. Thus, the scope of
22 the present invention should be determined by the appended claims and their legal
23 equivalents, rather than being limited to the examples given.

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2 BRIEF DESCRIPTION OF THE DRAWINGS

3 Fig. 1 is a right side view of the most preferred embodiment of the present invention
4 having two side valves positioned for water flow in perpendicular orientation to that of its
5 larger main valve body.

6 Fig. 2 is a front view of the most preferred embodiment of the present invention having a
7 large main valve body positioned for water flow in perpendicular orientation to that of
8 one visible smaller side valve.

9 Fig. 3 is a left side view of the main valve body of the most preferred embodiment of the
10 present invention connected between new and existing sections of water main pipe.

11 Fig. 4 is a top view of a prior art temporary backflow prevention assembly that could be
12 connected to the most preferred embodiment of the present invention during construction
13 of new and repaired/upgraded water main pipe to protect the existing water main pipe
14 from possible bacterial contamination prior to tie in of the new or repaired/upgraded pipe
15 once its pressure and bacterial testing is successfully completed.

16 Fig. 5 is a side view of the prior art temporary backflow prevention assembly previously
17 shown in Fig. 4 with its two backflow prevention valves and a fire line connection.

18 Fig. 6 is a schematic top view of the most preferred embodiment of the present invention
19 connected between new and repaired/upgraded water main pipe.

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21 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

22 The present invention provides a tri valve 1 that is installed onto an existing
23 potable water main pipe 7 by means of a tapping sleeve, a cut-in tee, an existing stub out,

1 an existing valve, and/or similar means (not shown), at the beginning of construction to
2 install a new section of water main pipe 8, or upgrade/repair an existing section of water
3 main pipe, for future use by residential or commercial developments to satisfy potable
4 water needs. For example, a contractor or utility company would excavate down to an
5 existing 12-inch water main 7 with an existing 12-inch stub out tee, or install a 12-inch
6 tapping saddle to core into an existing 12-inch potable water line 7. Thereafter, a 12-inch
7 by 6-inch present invention tri valve 1 would be installed by whatever means are
8 available to tie it in, as long as the tie in process is conducted in accordance with federal,
9 state, and/or local standards or specifications. When tie in is complete, the 12-inch main
10 valve gate 2 of the tri valve present invention 1 would be shut off. A temporary backflow
11 prevention assembly 19 (shown in Figs. 4 and 5) with its two check valves 12 would be
12 connected to the two 6-inch side valves 3 of the tri valve present invention 1. The
13 backflow prevention assembly 19 contemplated for use with the present invention is the
14 same one currently in use throughout the United States to prevent contamination from
15 coming back into the potable water main pipes 7 from irrigation, fire sprinkler, and other
16 areas where backflow into existing water mains could cause bacterial contamination of
17 the potable water being used by the general public. The temporary backflow prevention
18 assembly 19 is installed above ground with its two check valves 12 also being positioned
19 above ground, and it is temporarily used to fill new water mains 8 and satisfy other on-
20 site water needs. The backflow prevention assembly 19 connection to the present
21 invention tri valve 1 is temporary, and when it is removed the temporary backflow
22 prevention assembly 19 is available for reuse at the next phase of new water main
23 installation or repair/upgrade, or in other appropriate applications. Subsequent to

1 connection of the temporary backflow prevention assembly 19 to the present invention 1,
2 and after all new pipe 8 for potable water use is installed in a new development or needed
3 pipe repair/upgrade is complete, and also before the new or upgraded water main pipe 8
4 is activated for public use, the new or upgraded section of water main pipe 8 is pressure
5 tested and bacteria tested according to government standards. After the new or upgraded
6 water main pipe 8 successfully passes all testing requirements, the two 6-inch side valves
7 3 of the present invention tri valve 1 are shut off and plugged. The temporary backflow
8 assembly 19 is thereafter removed, and the 12-inch valve 2 on the present invention tri
9 valve 1 is then opened. Since the new/upgraded pipe 8 was not exposed to any air or
10 potential bacterial contamination as a result of removal of the temporary backflow
11 prevention assembly 19 and it had previously passed all required pressure and bacteria
12 testing, and also since during new pipe construction or upgrade the existing water main 7
13 was protected from any source of contamination backflow, the new/repaired/upgraded
14 water main section 8 can be safely used after the main valve body 2 of the present
15 invention tri valve 1 is opened. The present invention tri valve 1 can be used and
16 manufactured in many sizes to meet local water demands and the needs of the population
17 served by the new and existing sections of water main pipe, and the measurements
18 provided herein above are merely examples of appropriate measurements in one specific
19 application. Should the present invention 1 incorporate gate valves 2 and 3 having
20 diameter dimensions between three inches and twenty inches, they would be constructed
21 to meet or exceed the requirements of AWWAC509. Should the present invention
22 incorporate larger valves 2 and 3, such as Butterfly valves having diameter dimensions
23 twenty-four inches or greater, they would be constructed to meet or exceed the

1 requirements of AWWAC504. All valve construction in present invention tri valve 1
2 shall also conform to standards of the American Society for Testing and Materials
3 (ASTM).

4 Figs. 1-3 show the most preferred embodiment of the present invention tri valve
5 1. Fig. 1 shows the present invention tri valve 1 having one main valve body 2 and two
6 side valve bodies 3. For convenience in connecting a temporary backflow prevention
7 assembly 19 (see Figs. 4 and 5) to side valve bodies 3, the flow of water through the main
8 gate valve connections 5 is in substantially perpendicular orientation to the flow of water
9 through both of the side valve connections 6. Main valve body 2 and side valve bodies 3
10 are not in fluid communication with one another. Fig. 1 further shows the keyed valve
11 stems 4 on the top of main valve body 2 and side valve bodies 3 that are used to open and
12 close the wedge gates 18 (see Fig. 2 for a schematic representation of a wedge gate 18)
13 respectively within each main valve body 2 and side valve body 3. Fig. 1 shows side
14 valve bodies 3 having a smaller cross-sectional configuration than main valve body 2,
15 and if main valve body 2 is configured for connection to twelve-inch water main pipe,
16 side valve bodies could be configured for connection to six-inch water main pipe to
17 supply on-site construction water needs. Fig. 2 shows the most preferred embodiment of
18 the present invention tri valve 1 with the number 17 showing the preferred position of a
19 rubber gasket, the number 16 showing the preferred position of an o-ring, and the number
20 18 showing the gate valve that is within each main valve body 2 and side valve body 3 to
21 open and close them. Fig. 2 only shows one side valve body 3, as the second side valve
22 body 3 is behind the one shown and hidden in Fig. 2. Fig. 3 shows main valve body 2
23 connected between existing water main pipe 7 and a new/upgraded/repaired section of

1 water main pipe 8. As in Figs. 1 and 2, Fig. 3 also shows both side valve bodies 3
2 connected on the same side of the present invention tri valve.

3 Figs. 4 and 5 show a prior art jumper system wherein a temporary backflow
4 prevention assembly 19 having two test valves 13, two check valves 12, a fire line
5 connection 14, two sections of riser pipe 11, and elbow fittings 10, is connected in-line
6 with a gate valve 9 between existing water main pipe 7 and a new/repaired/upgraded
7 section of water main pipe 8. In contrast, Fig. 6 shows how a present invention tri valve
8 1 would be connected during water main construction. A temporary backflow prevention
9 assembly 19 identical to or similar to that shown in Figs. 4 and 5 can be connected to the
10 side valve bodies 3 of the present invention tri valve 1 and used with it to supply water
11 needed for on-site or fire fighting purposes during construction involving installation,
12 repair, or upgrade of water main pipe 8. Therefore, as shown in Fig. 4, the order of
13 positioning using known prior art water main construction methods is existing water main
14 pipe 7, gate valve 9, temporary backflow prevention assembly 19, and
15 new/repaired/upgraded water main pipe 8. In contrast and as shown in Fig. 6, the order
16 of positioning using the present invention tri valve is existing water main pipe 7, tri valve
17 1, and new/repaired/upgraded water main pipe 8, with the temporary backflow prevention
18 assembly 19 connected only to the two side valve bodies 3 of tri valve 1, and no direct
19 connection existing between the temporary backflow prevention assembly 19 and the
20 new/repaired/upgraded water main pipe 8. As a result, after the new/repaired/upgraded
21 water main pipe 8 successfully passes pressure and bacterial testing, the tri valve 1
22 remains in its original location, and its connection to the existing water main pipe 7 and
23 new/repaired/upgraded water main pipe 8 is not breached during the activation of the

1 new/repaired/upgraded water main pipe 8 for its delivery of safe drinking water to the
2 public. Instead, activation of the new/repaired/upgraded water main pipe 8 using the tri
3 valve 1 simply requires shutting off the two side valve bodies 3 using their keyed valve
4 stems 4, plugging the two side valve connections 6 to avoid leakage, removing the
5 temporary backflow prevention assembly 19 without loss of water from the
6 new/repaired/upgraded water main pipe 8, and using the keyed valve stem 4 on the main
7 valve body 2 to open it and cause good clean drinking water to flow from the existing
8 water main pipe 7 into the new/repaired/upgraded water main pipe 8. Since water is
9 drained from the new/repaired/upgraded water main pipe 8, large amounts of good
10 drinking water are not wasted on flushing/refilling steps after it successfully passes the
11 required initial pressure and bacterial testing. Fig. 5 shows in broken lines the position of
12 a sleeve 15 that is needed to span the approximate eight foot gap that will occur during
13 prior art methods of water main construction between the existing water main pipe 7 and
14 a new/repaired/upgraded section of water main pipe 8 once construction is finished and
15 the temporary backflow prevention assembly 19 is removed. It is during this step of
16 removing the temporary backflow prevention assembly 19, and the process of replacing it
17 with an additional section of water main pipe (not shown), that causes water to be drained
18 from the successfully tested new/repaired/upgraded section of water main pipe 8 and
19 exposes it to possible bacterial contamination, flushing with copious amounts of good
20 drinking water, and retesting to meet pressure and bacteria requirements. Since the
21 present invention tri valve 1 is never removed once it is installed between existing water
22 main pipe 7 and new/repaired/upgraded sections of water main pipe 8, overall inspection
23 and testing time of the new/added sections of water main pipe 8 are reduced compared to

1 prior art methods, with only one testing event being required prior to removal of the
2 temporarily installed conventional backflow prevention assembly 19 and no testing
3 events being needed after its removal. Reduced labor translates into reduced job cost,
4 however, use of the present invention tri valve 1 also reduces material cost as use of a
5 connection sleeve 15 between existing 7 and new 8 sections of water main pipe is no
6 longer required after temporarily installed conventional backflow prevention assembly 19
7 removal.
8